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Please find below the README information of the required contents for code and software submission checklist. We provide step-by-step instructions to run the code for our work entitled "**Dynamic functional connectivity encodes generalizable representations of emotional arousal across individuals and situational contexts**".

1. **System requirements**
   MATLAB_R2022b, python 3.9.0 with the following packages installed: numpy, pandas, os, sklearn, scipy, warnings. No special non-standard hardware is required.

2. **Installation guide**
   Running the scripts requires Jupyter notebook, which can be downloaded from the two websites below. Typical downloading time should be less than 5 minutes.
   1) https://www.anaconda.com/download
   2) https://jupyter.org/install

3. **Demo**
   Compiled source code and data: AffectPrediction.zip. Please download the file here: https://uchicago.box.com/s/pgdyc5pfcy17r73ysy81om739r8nyddv
   Upon downloading the file, we suggest you running the scripts in the order below. Just to note: no change of file path is needed. All the code and data are arranged in relative path.

   **Step 1:**
   **Calculating dynamic functional connectivity from 122-ROI-based BOLD time series.**

   1) Code path: *'./AffectPrediction/code/a_preprocess'*.
   2) Run *a_slidingFC_Sherlock.m*, *b_slidingFC_FNL.m*, and *c_slidingFC_Merlin.m* in MATLAB. The scripts take 122-ROI-based BOLD time series (*'./AffectPrediction/data/brain/{dataset }/a_output/ROIsum.mat*), compute dynamic functional connectivity, and save the FC matrices at (*'./AffectPrediction/data/brain/{dataset}/a_output/FC/sliding-dynFeat.mat)*.
   3) This process can take 1-3 hours depending on the computing power of your device. To save you some time, I included these FC files in the folder but feel free to try running the script yourself.

   **Step 2:**
   **Within- and Across-dataset predictions on valence and arousal.**

   1) Code path: *'./AffectPrediction/code/b_analysis'*. These analyses correspond to the following sections in the Results part of the manuscript:
      - *Dynamic functional connectivity encodes arousal within and across datasets*
      - *Connectome-based models of arousal generalized to two more fMRI datasets*
      - *Dynamic functional connectivity does not predict moment-to-moment valence*
   2) Open Jupyter Notebook and please run the scripts in a-e order. For each script, we suggest you go to Kernel – Restart & Run All.
      a) *a_Within_Sherlock.ipynb*. Within-dataset predictions of valence and arousal in *Sherlock*, saves results at *./AffectPrediction/results/sherlock/within_prediction*' for

later use of across-dataset predictions. This process can take 10-20 minutes depending on the computing power of your device.

b) *b_Within_FNL.ipynb*. similar as a) but in *Friday Night Lights*. This process can take 30-60 minutes depending on the computing power of your device

c) *c_Across_Sher-FNL.ipynb*. Across-dataset predictions of valence and arousal from *Sherlock* to *Friday Night Lights*. This should take less than 5 minutes.

d) *d_Across_FNL-Sher.ipynb*. Across-dataset predictions of valence and arousal from *Friday Night Lights* to *Sherlock*. This should take less than 5 minutes

e) *e_overlap-Merlin_arousal.ipynb*. This script takes results from within-dataset predictions to compute an overlap arousal network (Fig. 4B in the manuscript), then train a CPM on the overlap arousal network by combining data from *Sherlock* and *Friday Night Light* to predict arousal in *Merlin*. This should take less than 5 minutes

**Step 3:**

**Applying the arousal model that we identified to your own fMRI data, to generate a moment-to-moment prediction of the arousal fluctuations.**

a) Parcellate your brain data into 122 ROIs, Yeo 114 for cortical ROIs, and Brainnectome for the 8 subcortical regions (following this order: left amygdala, hippocampus, basal ganglia, and thalamus, right amygdala, hippocampus, basal ganglia, and thalamus).

b) Calculate dynamic functional connectivity patterns using this code by Hayoung Song: https://github.com/hyssong/NarrativeEngagement/blob/main/code/preprocess/slidingFC.m The final output should be: nsubj*nFC(8376)*nT(nTR-sliding window size)

c) Run this code: ./arousal_network/apply_model.ipynb. This code uses the pre-defined arousal network (arousal_network.mat) and the pre-trained SVR (svr_model.pkl)

**4. Instruction to use**

For MATLAB scripts: open MATLAB and double click the scripts

For python scripts: Open Anaconda-Navigator and click the “Launch” icon under Jupyter Notebook. This will open a webpage in your browser.

**Additional information:**

Link to code in an open source repository (we have it on github):

https://github.com/jinke828/AffectPrediction

Please do not hesitate to reach out if you have any questions.

Sincerely,

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